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Characteristics of logging residues in the Vancouver Forest Region, 1981

G.H. Manning and M.R.C. Massie

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by

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Foreword

ENFOR is the acronym for the Canadian Government's ENergy from the FORest (ENergie de la FORêt) program of research and development aimed at securing the knowledge and technical competence to facilitate in the medium to long term a greatly increased contribution from forest biomass to our nation's primary energy production. This program is part of a much larger federal government initiative to promote the development and use of renewable energy as a means of reducing dependence on petroleum and other non-renewable energy sources.

The Canadian Forestry Service (CFS) administers the ENFOR Biomass Production program component which deals with such forest-oriented subjects as inventory, harvesting technology, silviculture and environmental impacts. (The other component, Biomass Conversion, deals with the technology of converting biomass to energy or fuels, and is administered by the Renewable

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Abstract

Data from the B.C. Ministry of Forests Waste Survey of 1981 logging were recompiled and analyzed to characterize logging residue by type of yarding, slope of setting, season of logging, and tenure. Compilations were by diameter, length and type of material. Average volume per hectare was almost 70 m³. There were no significant differences by tenure, but impacts of slope, method of yarding and season of logging were evident.

Résumé

Les données de l'étude du ministère des Forêts de la Colombie-Britannique sur les résidus d'exploitation produits en 1981 ont été reprises et analysées afin d'établir les caractéristiques des résidus en fonction du type de débusquage, de la pente du terrain, de la saison d'exploitation et de la tenure. Les données considérées sont le diamètre, la longueur et le type de matériel. Nous avons déterminé que le volume moyen à l'hectare était de 70 m³. Nous n'avons pas observé de différences significatives en fonction de la tenure. Par contre, les effets de la pente, de la méthode de débusquage et de la saison d'exploitation sont évidents.

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Introduction

Characterization of logging residues is an important step in the design and development of efficient residue recovery systems. This information is also useful in planning optimum utilization of the resource, site preparation for planting, and fuel management for fire prevention. A number of studies in the United States and Canada (e.g., Bergvall *et al.* 1978; Blakeney 1980; Howard 1973 1981; Larry Brown and Associates Inc. 1981; Pong and Henley 1984) have made both the case for utilizing residue inventory, and explored ways of utilizing such data.

In 1983, the Canadian Forestry Service, through the ENFOR program, contracted with Nawitka Renewable Resource Consultants to characterize the logging residue in the Vancouver Forest Region (Massie 1984). The harvest year 1981 was chosen as representative. The data base consisted of the B.C. Ministry of Forests Vancouver Region Waste Survey in 1982. The Ministry measures logging waste for cut control and to recover revenue from wasteful logging practices. Data characteristics and study sample statistics are detailed in Appendices I and II, respectively.

Analysis

Data as to volume of waste were classified as to tenure, type of logging, slope of the setting, season of logging, and location on the setting. Detailed statistics are presented in Appendix III. Average volume per hectare sampled for all classifications is presented in Table 1. Overall average is nearly 70 m³/ha, most of which was logs and slabs.

As expected, the highest concentrations of residue were found on the landing (Fig. 1). There was no significant difference in levels in either location between tenures.

Other, more interesting relations were developed with regard to slope of the setting (Figs. 2 and 3). On settings, residue levels (logs and slabs) were highest for high lead yarding at slopes of 21-33% (class 3), with nearly 47 m³/ha present, as compared with 31 m³/ha for grapple yarding. Highest concentrations for grapple yarding were at slopes of 34-50% (class 4), with 49 m³/ha. Concentra-

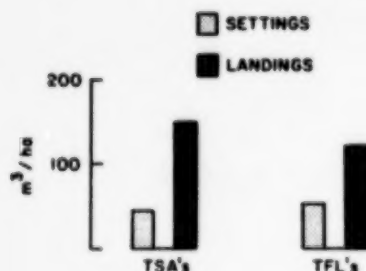


Figure 1. Volume of logging residues on landings and settings, by tenure, Vancouver Region 1981.

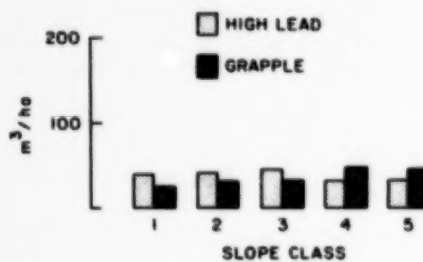


Figure 2. Volume of residue on the setting, by slope class and yarding method, Vancouver Region, 1981.

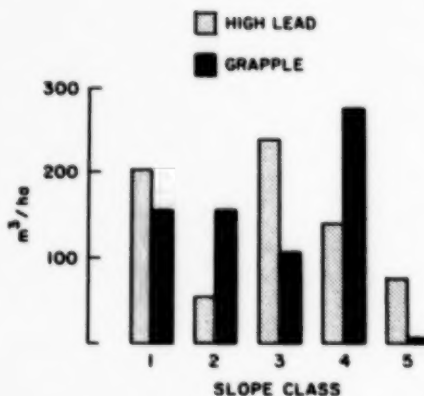


Figure 3. Volume of residue on landings, by slope class for setting and yarding method, Vancouver Region, 1981.

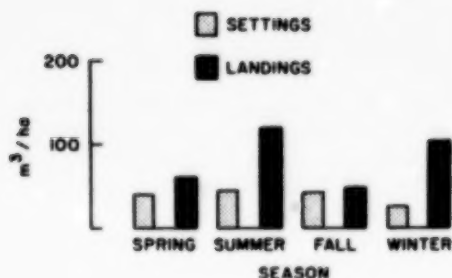


Figure 4. Volume of residue (logs and slabs) on logging settings and landings, by season of logging, Vancouver Region, 1981.

tions were much higher at landings, with class 3 high lead landings showing 234 m³/ha, and class 4 grapple landings with 276 m³/ha. The fact that steeper slopes produce "dirtier" landings is no surprise, as steep slopes tend to produce more breakage during felling and yarding.

Contrary to an often-expressed opinion, winter

logging on the Coast did not produce the highest volume of residue (Fig. 4). Rather, summer logging was most productive of log and slab residue, both on the logging setting and on the landing, at 44 m³/ha and 119 m³/ha, respectively. There are a number of potential reasons for this, among which are species composition of the stands and the experience levels of the logging crews, summer vs winter.

Conclusions

The 1981 Vancouver Region Waste Survey, when analyzed for the ENFOR Program, provided strong guidelines for development of a residue recovery strategy. First, recovery should concentrate on material already at the landing. This holds true for all tenures, slopes and yarding methods. The greatest portion (56%) of material is more than 25 cm in diameter and 3 m in length. This is fortunate, as present recovery and transport systems tend to favor such size classes (Sinclair 1984; Sinclair 1985).

TABLE 1. Waste volume (m³/ha) in combined logs and slabs and stumps, tops and duntrees, in all landings and logging settings in Vancouver Region TSAs and TFLs combined, 1981 logging*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.02	0.05	0.13	0.26	0.32	0.40	0.39	0.55	0.44	5.08	7.64	11
1.0-2.9	1.01	1.06	1.07	0.89	0.79	0.79	0.57	0.53	0.39	2.32	9.41	13
3.0-4.9	2.46	4.12	3.53	3.02	1.94	1.62	1.27	0.99	0.82	3.09	22.85	33
5.0-6.9	0.81	2.22	2.00	1.71	1.25	1.25	0.65	0.79	0.45	2.62	13.73	20
7.0>	0.57	2.78	2.25	1.78	1.77	1.42	1.14	1.39	0.65	2.52	16.26	23
TOTAL	4.86	10.22	8.97	7.65	6.08	5.48	4.02	4.24	2.74	15.63	69.89	
%	7	15	13	11	9	8	6	6	4	22		100

* Approx. 58% whitewood, 34% cedar and 8% mixed wood
Sample size 636 plots totalling 27,929 ha

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Appendix I

Data characteristics

The data are for sound wood measured to coast inventory standards for waste and cut control purposes. The minimum piece diameter, inside bark, small end, was 15 cm. Bark and decay are not included. In general the areas were logged in 1981 and sampled in 1982. The analysis includes nearly 50 percent of all the samples taken in the region based on 1982 records. It covers TFL's 2, 19, 20, 25, 37 and 38, as well as logging by seven major companies or their subsidiaries in the Region's five timber supply areas.

Detailed specifications, procedures, methodology and sampling techniques are described in British Columbia, Ministry of Forests, Waste Survey Procedures (1981).

Appendix II

Study sample statistics

1. Number of logging settings or openings sampled:

TFL = 45
TSA = 52
Total = 97

2. Some eight species accounted for 99% of the total number of pieces of waste sampled. Species were grouped as follows:

Whitewood = W. hemlock, balsam or true fir, lodgepole pine and Sitka spruce

Cedar = W. red cedar

Mixed wood = Douglas-fir, cypress or yellow cedar and alder

3. Based on the entire 7489 pieces sampled (TFL's and TSA's, all slash and landing plots, and all logs, slabs, tops and duntrees) the species mix was as follows:

Whitewood = 70% hemlock
26% balsam
4% pine
(rounding eliminated spruce which was less than 1%)

Cedar = 100% red cedar

Mixed wood = 64% Douglas-fir
34% cypress
2% alder

The species grouping is given as a footnote on all tables where the information might be of interest (i.e. percentage of whitewood, cedar, and mixed wood).

4. Net logged area that was sampled (i.e. area of settings)

TSA = 1177 ha (average setting 23 ha)
TFL = 1638 ha (average setting 36.4 ha)

5. Number of landings in the 45 TFL's and 52 TSA settings or openings:

TSA = 7 grapple, 193 high lead
TFL = 40 grapple, 151 high lead

Average size of landings:

TSA = grapple, 0.76 ha; high lead, 0.095 ha
TFL = grapple, 0.98 ha; high lead, 0.10 ha

6. Number of sample plots taken:

TSA = slash plots	277
grapple landing plots	7
high lead landing plots	40
TFL = slash plots	246
grapple landing plots	40
high lead landing plots	<u>26</u>
Total	636

7. Size of sample plots:

Slash plots were 0.04 ha (one or several were taken per setting, depending on setting size).

Grapple landing plots were 0.04 ha in nearly all cases. One or more were taken depending on the size of the landing, particularly the length along the road. Note that grapple landings are more or less continuous in length along sections of road, and cannot be precisely defined in area in many cases. For the purposes of this report, the average size of grapple landings relates to the size of the accumulations sampled by the B.C. Ministry of Forests in the 1981 waste surveys.

High lead landings were frequently about 0.1 ha in size and the usual procedure was to sample an entire landing. Average size of all high lead landing plots was 0.08 ha for TSA's and 0.075 ha for TFL's.

8. Coefficients for converting piece counts to volumes:

The Smalian formula was used to convert piece counts to volumes in the matrices shown. Each cell was calculated on the basis of average length and average diameter, except those cells having an "open-end" diameter or length (i.e., length less than 1.0 m or greater than 7.0 m, and a diameter greater than 60.0 cm). These cells were calculated on the basis of averages of 100 or more samples taken from the data randomly.

These factors are as follows:

Length < 1.0 m	— logs and slabs avg.	= 0.57 m
	— stumps avg.	= 0.38 m
	— all pieces avg.	= 0.44 m
> 7.0 m	— logs and slabs avg.	= 10.0 m
	— all pieces avg.	= 10.0 m

Diam. > 60.0 cm	— logs and slabs avg.	= 71.2 cm
	— stumps avg.	= 84.0 cm
	— all pieces avg.	= 77.28 cm

9. The slope classification used is the same as Hedin (1978) and is based on the Swedish terrain classification system.

Class	Slope Percent	Slope Degrees
1	0 - 10	0 - 6
2	11 - 20	7 - 11
3	21 - 33	12 - 18
4	34 - 50	19 - 27
5	51 plus	28 plus

Appendix III

Table A1. Waste volume of logs and slabs, stumps, duntrees and treetops in all landings and logging settings in Vancouver Region TSAs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.03	0.06	0.15	0.27	0.35	0.46	0.44	0.53	0.42	5.19	7.90	12
1.0-2.9	0.78	0.96	0.90	0.88	0.73	0.72	0.56	0.48	0.43	2.52	8.96	13
3.0-4.9	2.01	3.54	3.12	2.62	1.82	1.52	1.07	0.89	0.57	2.98	20.16	30
5.0-6.9	0.77	2.05	1.79	1.44	1.19	1.17	0.44	0.81	0.54	2.33	12.52	19
7.0>	0.58	2.29	2.21	2.11	1.67	1.95	0.98	1.34	0.89	2.91	16.94	25
TOTAL	4.16	8.90	8.16	7.32	5.76	5.83	3.49	4.05	2.85	15.94	66.47	
%	6	13	12	11	9	9	5	6	4	24		100

* Approx. 54% whitewood, 38% cedar and 8% mixed wood.
Sample size 324 plots totalling 14.549 ha.

Table A2. Waste volume of logs and slabs, stumps, tops and duntrees, in all landings and logging settings in Vancouver Region TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.02	0.12	0.25	0.29	0.34	0.34	0.56	0.47	4.99	7.39	10
1.0-2.9	1.25	1.17	1.26	0.91	0.86	0.87	0.58	0.58	0.35	2.10	9.93	13
3.0-4.9	2.97	4.77	3.98	3.46	2.07	1.73	1.48	1.10	1.08	3.22	25.86	35
5.0-6.9	0.86	2.41	2.23	2.00	1.33	1.33	0.87	0.77	0.35	2.94	15.10	20
7.0>	0.55	3.31	2.30	1.42	1.89	0.85	1.32	1.45	0.39	2.10	15.59	21
TOTAL	5.64	11.69	9.88	8.04	6.45	5.12	4.60	4.47	2.64	15.36	73.88	
%	8	16	13	11	9	7	6	6	4	21		100

* Approx. 62% whitewood, 31% cedar and 7% mixed wood
Sample size 312 plots totalling 13.38 ha

Table A3. Waste volume of logs and slabs, stumps, duntrees and treetops in all landings, Vancouver Region TSAs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.02	0.08	0.18	0.29	0.22	0.36	0.38	0.28	0.36	1.91	4.09	3
1.0-2.9	1.31	1.57	1.91	1.76	1.40	1.71	1.53	1.00	0.90	3.51	16.59	11
3.0-4.9	3.97	7.89	7.98	6.86	4.44	3.59	2.44	1.49	1.19	4.86	44.72	30
5.0-6.9	1.61	4.65	4.70	3.86	3.43	2.69	1.22	2.61	0.90	7.29	32.97	22
7.0>	1.17	6.04	6.65	7.15	5.71	6.93	3.06	3.11	3.73	6.75	50.30	34
TOTAL	8.08	20.23	21.42	19.92	15.20	15.28	8.63	8.49	7.08	24.34	148.67	
%	5	14	14	13	10	10	6	6	5	16		100

* Approx. 50% whitewood, 46% cedar and 4% mixed woods
Sample size 47 plots totalling 3.469 ha

Table A4. Waste volume of logs and slabs, stumps, duntrees and treetops in the logging settings, Vancouver Region TSAs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.03	0.06	0.14	0.26	0.38	0.48	0.46	0.61	0.43	6.18	9.02	22
1.0-2.9	0.61	0.76	0.58	0.60	0.52	0.41	0.25	0.31	0.28	2.20	6.50	16
3.0-4.9	1.38	2.15	1.58	1.28	0.99	0.87	0.64	0.70	0.37	2.36	12.32	31
5.0-6.9	0.50	1.22	0.86	0.67	0.48	0.69	0.19	0.23	0.42	0.76	6.02	15
7.0>	0.39	1.10	0.80	0.52	0.40	0.38	0.32	0.78	0.00	1.69	6.38	16
TOTAL	2.91	5.29	3.95	3.32	2.76	2.83	1.86	2.63	1.51	13.18	40.24	
%	7	13	10	8	7	7	5	7	4	33		100

* Approx. 57% whitewood, 33% cedar and 10% mixed woods
Sample size 277 plots totalling 11.08 ha

Table A5. Waste volume in combined logs and slabs and stumps, tops and duntrees, at all landings in the Vancouver Region TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.05	0.13	0.27	0.19	0.25	0.24	0.40	0.26	1.81	3.62	3
1.0-2.9	2.14	1.88	1.90	1.31	1.68	2.16	0.90	1.10	0.00	2.38	15.44	13
3.0-4.9	5.91	9.29	7.08	6.34	3.23	1.60	2.19	1.46	1.75	5.82	44.67	37
5.0-6.9	1.54	4.76	4.31	3.50	2.80	2.87	1.50	1.10	0.44	7.14	29.94	25
7.0>	0.61	7.14	5.01	3.27	4.04	1.60	0.50	2.44	0.73	2.65	27.97	23
TOTAL	10.21	23.12	18.42	14.68	11.93	8.47	5.33	6.50	3.18	19.80	121.64	
%	8	19	15	12	10	7	4	5	3	16		100

* Approx. 60% whitewood, 34% cedar and 6% mixed wood
Sample size 66 plots totalling 3.54 ha

Table A6. Waste volume in combined logs and slabs and stumps, tops and duntrees, in all logging settings in the Vancouver Region TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.01	0.11	0.24	0.33	0.37	0.38	0.62	0.55	6.15	8.78	15
1.0-2.9	0.94	0.92	1.03	0.78	0.56	0.40	0.47	0.40	0.48	2.01	7.98	14
3.0-4.9	1.91	3.15	2.87	2.43	1.66	1.79	1.23	0.97	0.85	2.30	19.16	34
5.0-6.9	0.61	1.57	1.48	1.47	0.81	0.78	0.65	0.66	0.32	1.44	9.79	17
7.0>	0.54	1.94	1.33	0.76	1.12	0.58	1.62	1.10	0.26	1.91	11.17	20
TOTAL	4.01	7.60	6.82	5.67	4.48	3.92	4.35	3.75	2.45	13.81	56.88	
%	7	13	12	10	8	7	8	7	4	24		100

Approx. 63% whitewood, 30% cedar and 7% mixed wood
Sample size 246 plots totalling 9.84 ha

Table A7. Waste volume of logs and slabs, Class 1 Slope (0-10%), all species, High Lead Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.00	0.00	0.12	0.00	0.11	0.13	0.00	0.00	0.30	0.66	2
1.0-2.9	0.25	0.42	0.47	0.87	0.29	0.00	0.47	0.00	0.00	0.00	2.76	9
3.0-4.9	0.50	2.71	2.18	1.74	0.00	0.00	1.86	0.00	0.00	4.19	13.19	41
5.0-6.9	0.00	0.94	0.00	0.65	0.87	0.00	0.00	1.71	0.00	0.00	4.17	13
7.0>	0.00	0.00	0.78	0.00	0.00	0.00	2.33	2.84	0.00	5.24	11.19	35
TOTAL	0.76	4.06	3.43	3.39	1.16	0.11	4.79	4.55	0.00	9.73	31.97	
%	2	13	11	11	4	0	15	14	0	30		100

* Sample size 19 plots totalling 0.76 ha

Table A8. Waste volume of logs and slabs Class 1 Slope (0-10%), all species, High Lead Shows (high lead landings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.45	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0
1.0-2.9	0.48	1.06	0.39	1.10	1.47	0.94	1.18	1.44	1.73	0.00	9.79	5
3.0-4.9	1.91	2.64	3.94	6.62	5.87	3.77	11.79	0.00	3.46	10.62	50.62	25
5.0-6.9	0.48	6.33	3.55	3.31	2.20	8.49	0.00	8.64	0.00	31.85	64.85	32
7.0>	1.59	3.96	3.94	5.51	11.01	14.15	5.89	7.20	8.64	13.27	75.18	37
TOTAL	4.46	14.44	12.06	16.54	20.56	27.36	18.86	17.28	13.82	55.74	201.12	
%	2	7	6	8	10	14	9	9	7	28		100

* Sample size 4 landings totalling 0.3 ha

Table A9. Waste volume of logs and slabs, Class 2 Slope (11-20%), all species, High Lead Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
< 1.0	0.02	0.02	0.03	0.00	0.05	0.07	0.09	0.00	0.00	0.00	0.28	1
1.0-2.9	0.78	0.68	0.81	0.85	0.19	0.73	0.00	0.37	0.00	0.68	5.11	13
3.0-4.9	1.23	2.31	1.83	1.42	1.52	0.49	0.61	0.74	0.89	2.74	13.79	36
5.0-6.9	0.62	0.61	0.92	0.85	0.57	0.00	1.82	0.00	1.34	2.05	8.78	23
7.0>	0.21	0.34	1.02	0.00	1.89	0.00	0.00	3.72	0.00	3.42	10.60	27
TOTAL	2.86	3.97	4.61	3.13	4.22	1.29	2.52	4.83	2.23	8.90	38.56	
%	7	10	12	8	11	3	7	13	6	23		100

* Sample size 29 plots totalling 1.16 ha

Table A10. Waste volume of logs and slabs, Class 2 Slope (11-20%), all species, High Lead Shows (high lead landings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
< 1.0	0.00	0.00	0.00	0.06	0.00	0.00	0.13	0.00	0.00	0.00	0.19	0
1.0-2.9	0.87	1.65	1.54	1.72	2.29	0.74	0.00	1.12	0.00	0.00	9.92	16
3.0-4.9	4.10	5.76	4.30	3.44	3.43	0.00	0.92	1.12	0.00	2.07	25.15	41
5.0-6.9	0.93	0.93	0.92	2.58	0.86	0.00	0.00	0.00	0.00	9.31	15.53	26
7.0>	0.62	0.51	0.00	2.15	1.43	0.00	0.00	0.00	0.00	5.17	9.89	16
TOTAL	6.52	8.84	6.76	9.94	8.01	0.74	1.05	2.25	0.00	16.55	60.67	
%	11	15	11	16	13	1	2	4	0	27		100

* Sample size 6 landings totalling 0.77 ha

Table A11. Waste volume of logs and slabs, Class 3 Slope (21-33%) all species, High Lead Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.02	0.03	0.06	0.04	0.08	0.03	0.00	0.10	0.22	0.59	1
1.0-2.9	0.47	0.82	0.73	0.59	0.93	0.64	0.11	0.98	0.17	1.04	6.49	14
3.0-4.9	1.65	2.16	2.54	2.69	1.72	1.47	1.61	0.00	0.67	2.07	16.58	35
5.0-6.9	0.28	1.39	1.38	1.45	1.29	1.10	0.69	1.26	0.51	2.33	11.69	25
7.0>	0.47	1.54	0.38	1.34	0.36	0.46	1.15	1.40	1.68	2.59	11.38	24
TOTAL	2.86	5.94	5.07	6.14	4.34	3.76	3.60	3.65	3.13	8.24	46.73	
%	6	13	11	13	9	8	8	8	7	18		100

* Sample size 77 plots totalling 3.08 ha

Table A12. Waste volume of logs and slabs, Class 3 Slope (21-33%), all species, High Lead Shows (high lead landings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.02	0.10	0.27	0.21	0.17	0.44	0.18	0.44	0.13	0.20	2.19	1
1.0-2.9	1.25	1.93	2.78	2.99	1.79	2.56	1.92	1.17	0.00	1.44	17.82	8
3.0-4.9	3.80	8.44	8.76	10.16	5.57	7.16	7.66	1.56	1.87	4.31	59.30	25
5.0-6.9	1.81	7.72	8.98	8.07	5.37	5.37	1.92	2.34	2.81	10.79	55.17	24
7.0>	0.86	10.37	12.83	10.46	9.95	19.17	4.79	3.90	9.36	17.98	99.66	43
TOTAL	7.76	28.55	33.62	31.88	22.85	34.69	16.47	9.42	14.18	34.72	234.13	
%	3	12	14	14	10	15	7	4	6	15		100

* Sample size 12 landings totalling 1.108 ha

Table A13. Waste volume of logs and slabs, Class 4 Slope (34-50%), all species, High Lead Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.02	0.00	0.01	0.05	0.04	0.00	0.03	0.04	0.00	0.21	1
1.0-2.9	0.59	0.69	0.90	0.45	0.66	0.38	0.29	0.35	0.28	0.22	4.81	16
3.0-4.9	0.94	1.34	1.16	2.43	1.44	1.08	0.58	0.94	1.13	1.30	12.32	40
5.0-6.9	0.35	0.71	0.68	1.08	1.26	0.69	0.00	0.35	0.85	0.65	6.62	22
7.0>	0.33	1.08	0.97	0.22	1.20	0.77	0.96	0.00	0.00	1.08	6.61	22
TOTAL	2.21	3.83	3.70	4.20	4.61	2.97	1.83	1.68	2.30	3.25	30.56	
%	7	13	12	14	15	10	6	5	8	11		100

* Sample size 92 plots totalling 3.68 ha

Table A14. Waste volume of logs and slabs, Class 4 Slope (34-50%), all species, High Lead Shows (high lead landings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.02	0.05	0.19	0.04	0.10	0.06	0.32	0.20	0.12	0.36	1.48	1
1.0-2.9	1.27	1.53	2.09	0.93	1.42	3.64	1.42	0.35	0.42	2.56	15.63	11
3.0-4.9	3.69	5.47	6.85	4.79	4.25	0.46	2.84	1.39	3.33	3.84	36.92	27
5.0-6.9	1.04	4.01	3.14	3.59	1.06	5.46	1.71	2.08	3.75	11.52	37.37	27
7.0>	0.77	5.09	4.28	5.32	3.54	3.41	7.11	1.74	2.08	12.80	46.15	34
TOTAL	6.79	16.16	16.56	14.67	10.37	13.04	13.40	5.76	9.71	31.10	137.55	
%	5	12	12	11	8	9	10	4	7	23		100

* Sample size 15 landings totalling 1.243 ha

Table A15. Waste volume of logs and slabs, Class 5 Slope (50%+), all species, High Lead Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.02	0.01	0.01	0.00	0.11	0.00	0.00	0.00	0.05	0.20	1
1.0-2.9	0.38	0.59	0.30	0.23	0.40	0.45	0.16	0.88	0.35	0.18	3.92	12
3.0-4.9	0.96	3.09	2.42	2.03	2.20	1.16	1.28	0.98	0.00	1.08	15.20	48
5.0-6.9	0.39	1.13	1.05	0.90	0.00	0.77	0.72	0.00	0.00	1.63	6.59	21
7.0>	0.16	0.63	0.67	0.19	0.50	0.32	1.20	0.49	0.00	1.81	5.97	19
TOTAL	1.90	5.46	4.44	3.35	3.10	2.81	3.37	2.35	0.35	4.75	31.89	
%	6	17	14	11	10	9	11	7	1	15		100

* Sample size 110 plots totalling 4.4 ha

Table A16. Waste volume of logs and slabs Class 5 Slope (50%+), all species, High Lead Shows (high lead landings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.02	0.15	0.12	0.32	0.11	0.35	0.26	0.11	0.25	0.00	1.69	2
1.0-2.9	0.90	1.29	0.81	0.85	0.95	0.49	0.30	0.37	0.00	2.05	8.01	11
3.0-4.9	3.28	7.61	6.50	6.53	3.02	0.97	0.61	0.00	0.89	2.73	32.14	43
5.0-6.9	1.23	2.85	2.74	1.28	2.84	1.46	1.82	1.11	0.00	0.00	15.33	20
7.0>	0.21	2.38	1.52	3.55	0.95	2.43	0.00	3.71	0.00	3.42	18.15	24
TOTAL	5.65	14.28	11.69	12.53	7.86	5.69	2.99	5.30	1.14	8.20	75.33	
%	7	19	16	17	10	8	4	7	2	11		100

* Sample size 20 landings totalling 1.165 ha

Table A17. Waste volume of logs and slabs Class 1 Slope (0-10%), all species, Grapple Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0
1.0-2.9	0.62	0.29	0.66	0.15	0.20	0.00	0.65	0.00	0.96	0.00	3.54	14
3.0-4.9	0.97	2.20	2.41	1.84	0.82	0.52	1.31	2.40	0.00	0.00	12.47	50
5.0-6.9	0.40	1.32	1.32	0.00	1.22	0.79	0.00	0.00	0.00	0.00	5.04	20
7.0>	0.89	1.83	0.00	0.00	1.02	0.00	0.00	0.00	0.00	0.00	3.74	15
TOTAL	2.89	5.64	4.38	2.08	3.26	1.31	1.96	2.40	0.96	0.00	24.90	
%	12	23	18	8	13	5	8	10	4	0		100

* Sample size 27 plots totalling 1.08 ha

Table A18. Waste volume of logs and slabs Class 1 Slope (0-10%), all species, Grapple Shows (grapple landings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.06	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0
1.0-2.9	1.30	1.26	1.88	0.38	1.00	0.00	1.61	0.98	0.00	0.00	8.40	5
3.0-4.9	9.34	12.58	7.52	3.00	1.00	2.57	1.61	7.85	7.06	3.62	56.14	35
5.0-6.9	3.58	7.01	8.87	2.25	3.00	0.00	2.41	11.77	0.00	10.85	49.74	31
7.0>	1.09	8.09	12.09	1.88	15.00	0.00	8.03	0.00	0.00	0.00	46.17	29
TOTAL	15.37	28.93	30.59	7.51	20.00	2.57	13.65	20.60	7.06	14.46	160.75	
%	10	18	19	5	12	2	8	13	4	9		100

* Sample size 11 landings totalling 0.44 ha

Table A19. Waste volume of logs and slabs Class 2 Slope (11-20%), all species, Grapple Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0
1.0-2.9	0.68	1.46	1.54	1.80	0.96	0.00	0.77	0.00	0.56	0.00	7.77	26
3.0-4.9	1.98	3.10	2.32	2.16	0.96	1.85	1.54	0.00	0.00	0.00	13.89	47
5.0-6.9	1.25	1.81	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.21	14
7.0>	0.00	1.72	0.64	0.00	1.20	0.00	0.00	0.00	0.00	0.00	3.56	12
TOTAL	3.90	8.11	5.66	3.96	3.11	1.85	2.31	0.00	0.56	0.00	29.46	
%	13	28	19	13	11	6	8	0	2	0		100

* Sample size 23 plots totalling 0.92 ha

Table A20. Volume of logs and slabs Class 2 Slope (11-20%), all species, Grapple Shows (grapple landings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.11	0.08	0.00	0.31	0.61	0.76	0.62	0.37	0.00	2.86	2
1.0-2.9	2.75	3.56	3.85	2.07	3.30	7.78	6.19	6.48	2.59	3.98	42.56	27
3.0-4.9	3.83	10.69	8.29	4.14	9.91	1.42	3.54	2.16	0.00	19.91	63.87	40
5.0-6.9	0.36	1.78	1.78	0.00	1.65	4.25	0.00	3.24	3.89	5.97	22.92	14
7.0>	0.60	2.97	1.48	2.07	5.51	0.00	0.00	5.40	0.00	9.95	27.98	17
TOTAL	7.53	19.11	15.47	8.27	20.69	14.05	10.48	17.90	6.85	39.82	160.18	
%	5	12	10	5	13	9	7	11	4	25		100

* Sample size 10 landings totalling 0.4 ha

Table A21. Waste volume of logs and slabs Class 3 Slope (21-33%), all species, Grapple Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.01	0.01	0.02	0.03	0.00	0.04	0.00	0.00	0.00	0.13	0
1.0-2.9	0.82	0.63	0.99	0.65	0.19	0.37	0.00	0.19	0.23	0.00	4.07	13
3.0-4.9	1.85	2.50	2.81	2.18	0.00	2.24	0.62	0.38	0.00	0.00	12.57	41
5.0-6.9	0.63	1.46	1.09	2.61	0.00	0.75	0.47	0.00	0.00	1.05	8.05	26
7.0>	0.52	2.61	0.78	1.82	0.00	0.00	0.00	0.00	0.00	0.00	5.73	19
TOTAL	3.83	7.20	5.68	7.28	0.22	3.36	1.13	0.57	0.23	1.05	30.55	
%	13	24	19	24	1	11	4	2	1	3		100

* Sample size 57 plots totalling 2.28 ha

Table A22. Waste volume of logs and slabs Class 3 Slope (21-33%), all species, Grapple Shows (grapple landings) Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.02	0.00	0.26	0.14	0.53	0.00	0.00	0.00	0.00	0.96	1
1.0-2.9	2.39	2.41	1.16	1.98	0.48	2.15	0.00	0.47	0.00	1.73	12.77	12
3.0-4.9	6.24	11.53	7.98	6.83	2.39	0.62	0.77	0.00	0.00	3.46	39.82	38
5.0-6.9	1.56	4.39	6.95	4.85	4.31	2.77	1.15	0.00	0.00	0.00	25.98	25
7.0>	0.52	9.90	7.72	3.60	2.39	0.00	0.00	2.35	0.00	0.00	26.48	25
TOTAL	10.73	28.25	23.80	17.52	9.72	6.06	1.92	2.82	0.00	5.19	106.01	
%	10	27	22	17	9	6	2	3	0	5		100

* Sample size 23 landings totalling 0.92 ha

Table A23. Waste volume of logs and slabs Class 4 Slope (34-50%), all species, Grapple Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.16	0.13	0.00	0.00	0.12	0.00	0.00	0.24	0.00	0.00	0.64	1
1.0-2.9	1.47	1.52	2.73	1.59	1.27	0.00	0.68	0.83	0.00	3.06	13.14	27
3.0-4.9	2.02	2.74	3.18	1.91	1.69	3.26	0.00	0.00	1.99	3.06	19.84	40
5.0-6.9	0.83	0.91	0.68	0.95	0.00	1.63	0.00	2.49	2.99	0.00	10.48	21
7.0>	0.00	2.28	1.14	1.59	0.00	0.00	0.00	0.00	0.00	0.00	5.00	10
TOTAL	4.47	7.58	7.73	6.03	3.08	4.89	0.68	3.56	4.98	6.12	49.11	
%	9	15	16	12	6	10	1	7	10	12		100

* Sample size 13 plots totalling 0.52 ha

Table A24. Waste volume of logs and slabs Class 4 Slope (34-50%), all species, Grapple Shows (grapple landings) Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.42	0.84	1.77	2.35	1.01	0.63	0.77	1.85	0.00	9.64	3
1.0-2.9	5.98	4.95	11.84	4.14	4.13	3.54	6.63	5.40	3.24	14.93	64.77	23
3.0-4.9	11.36	21.77	23.67	22.74	13.77	7.08	0.00	5.40	0.00	0.00	105.79	38
5.0-6.9	5.38	14.84	8.88	3.10	4.13	10.61	0.00	0.00	0.00	0.00	46.95	17
7.0>	1.49	4.95	11.10	15.11	6.88	8.85	0.00	0.00	0.00	0.00	48.78	18
TOTAL	24.21	46.93	56.32	47.25	31.27	31.08	7.26	11.57	5.09	14.93	275.93	
%	9	17	20	17	11	11	3	4	2	5		100

* Sample size 4 landings totalling 0.16 ha

Table A25. Waste volume of logs and slabs Class 5 Slope (50%+), all species, Grapple Shows (logging settings), Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.62	0.00	0.00	0.85	2
1.0-2.9	0.96	3.17	1.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.90	14
3.0-4.9	2.39	5.54	2.37	3.31	2.20	2.83	7.07	0.00	0.00	0.00	25.72	61
5.0-6.9	0.00	0.00	1.78	2.48	0.00	4.25	0.00	0.00	0.00	0.00	8.50	20
7.0>	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	3
TOTAL	4.54	8.71	5.92	6.02	2.20	7.08	7.07	0.62	0.00	0.00	42.16	
%	11	21	14	14	5	17	17	1	0	0		100

* Sample size 5 plots totalling 0.2 ha

Table A26. Waste volume of logs and slabs Class 5 Shows (50%+), all species, Grapple Shows (grapple landings) Vancouver Region, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
1.0-2.9	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.79	13
3.0-4.9	0.00	2.63	0.00	2.75	0.00	0.00	0.00	0.00	0.00	0.00	5.37	87
5.0-6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
7.0>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
TOTAL	0.79	2.63	0.00	2.75	0.00	0.00	0.00	0.00	0.00	0.00	6.17	
%	13	43	0	45	0	0	0	0	0	0		100

* Sample size 3 landings totalling 0.12 ha

Table A27. Waste volume of logs and slabs in the logging setting during spring logging, Vancouver Region TSAs and TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.01	0.02	0.02	0.03	0.00	0.05	0.00	0.07	0.00	0.19	1
1.0-2.9	0.66	0.33	0.88	0.54	0.00	0.26	0.49	0.40	0.72	0.00	4.28	12
3.0-4.9	1.28	2.86	2.96	2.76	1.02	0.79	1.96	1.20	0.00	0.00	14.83	42
5.0-6.9	0.80	1.32	2.14	0.92	0.92	0.00	0.00	0.00	0.00	1.11	7.20	21
7.0>	0.44	1.83	1.92	0.38	2.04	0.00	0.00	0.00	0.00	1.84	8.46	24
TOTAL	3.19	6.35	7.91	4.62	4.01	1.05	2.50	1.60	0.79	2.95	34.96	
%	9	18	23	13	11	3	7	5	2	8		100

* Sample size 54 plots totalling 2.16 ha

Table A28. Waste volume of logs and slabs at high lead and grapple landings, spring logging, Vancouver Region TSAs and TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.02	0.05	0.05	0.03	0.12	0.14	0.12	0.07	0.11	0.72	1
1.0-2.9	0.66	0.79	0.68	0.71	0.42	1.22	0.85	1.24	0.99	0.38	7.94	12
3.0-4.9	3.57	4.16	3.17	3.16	0.84	0.54	1.01	0.83	1.98	5.33	24.60	38
5.0-6.9	1.23	2.72	3.06	0.24	1.58	0.81	0.51	2.48	0.74	0.00	13.37	20
7.0>	0.00	2.84	4.81	1.58	4.74	0.68	1.69	1.03	1.24	0.00	18.61	29
TOTAL	5.48	10.54	11.76	5.74	7.61	3.36	4.20	5.69	5.03	5.82	65.23	
%	8	16	18	9	12	5	6	9	8	9		100

* Sample size 19 plots totalling 2.09 ha

Table A29. Waste volume of logs and slabs in the logging setting during summer logging, Vancouver Region TSAs and TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.01	0.03	0.04	0.05	0.06	0.04	0.05	0.00	0.00	0.28	1
1.0-2.9	0.74	1.28	1.28	1.02	0.85	0.65	0.41	1.00	0.60	0.61	8.43	19
3.0-4.9	1.51	2.93	3.28	2.42	1.87	2.18	0.82	1.33	1.20	2.45	19.98	46
5.0-6.9	0.50	0.82	0.41	0.96	0.51	0.65	1.63	0.00	0.60	0.00	6.08	14
7.0>	0.09	0.91	0.68	0.00	0.00	0.54	2.04	3.33	0.00	1.53	9.14	21
TOTAL	2.85	5.95	5.68	4.43	3.27	4.09	4.94	5.70	2.40	4.60	43.91	
%	6	14	13	10	7	9	11	13	5	10		100

* Sample size 65 plots totalling 2.06 ha

Table A30. Waste volume of logs and slabs at high lead and grapple landings, summer logging, Vancouver Region TSAs and TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.02	0.03	0.05	0.12	0.08	0.39	0.12	0.00	0.00	0.80	1
1.0-2.9	1.51	2.19	2.83	0.95	2.74	2.16	1.69	1.24	0.00	1.52	16.82	14
3.0-4.9	3.47	6.05	4.75	4.74	5.47	1.08	4.05	1.65	0.99	6.08	38.34	32
5.0-6.9	0.69	2.04	2.03	4.74	1.26	3.24	1.01	0.00	1.49	13.69	30.19	25
7.0>	0.46	0.38	1.13	4.74	3.16	0.00	3.38	2.06	2.48	15.21	32.99	28
TOTAL	6.12	10.68	10.77	15.21	12.74	6.56	10.52	5.07	4.95	36.50	119.13	
%	5	9	9	13	11	6	9	4	4	31		100

* Sample size 15 plots totalling 1.05 ha

Table A31. Waste volume of logs and slabs in the logging setting during fall logging, Vancouver Region TSAs and TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.00	0.03	0.07	0.00	0.04	0.00	0.00	0.07	0.43	0.65	2
1.0-2.9	0.65	1.08	0.73	1.01	0.62	0.40	0.33	0.82	0.00	1.13	6.78	17
3.0-4.9	1.35	2.17	1.90	2.34	1.46	1.34	0.33	0.41	1.47	1.50	14.27	36
5.0-6.9	0.27	0.78	0.67	1.64	0.94	0.80	0.50	1.22	0.73	1.13	8.69	22
7.0>	0.11	0.93	0.28	0.78	0.00	0.67	0.83	1.02	2.45	1.88	8.96	23
TOTAL	2.41	4.97	3.61	5.84	3.02	3.24	2.00	3.47	4.72	6.07	39.34	
%	6	13	9	15	8	8	5	9	12	15		100

* Sample size 53 plots totalling 2.12 ha

Table A32. Waste volume of logs and slabs at high lead and grapple landings, fall logging, Vancouver Region TSAs and TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.06	0.00	0.13	0.00	0.11	0.00	0.67	0.40	0.31	1.67	3
1.0-2.9	0.84	0.96	1.28	1.34	0.59	0.00	0.48	0.58	0.00	0.00	6.08	12
3.0-4.9	4.26	5.34	5.75	2.68	3.57	3.06	1.91	0.00	1.40	0.00	27.97	57
5.0-6.9	0.97	1.92	1.44	0.67	0.00	3.44	0.00	0.00	0.00	0.00	8.44	17
7.0>	0.65	0.00	0.00	1.12	1.49	1.91	0.00	0.00	0.00	0.00	5.16	10
TOTAL	6.72	8.29	8.47	5.93	5.65	8.52	2.39	1.25	1.80	0.31	49.32	
%	14	17	17	12	11	17	5	3	4	1		100

* Sample size 10 plots totalling 0.74 ha

Table A33. Waste volume of logs and slabs in the logging setting during winter logging, Vancouver Region TSAs and TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.01	0.01	0.01	0.05	0.02	0.03	0.00	0.05	0.00	0.00	0.19	1
1.0-2.9	0.74	0.69	0.67	0.19	0.08	0.21	0.13	0.16	0.20	0.00	3.09	12
3.0-4.9	1.52	2.28	2.24	1.76	0.50	1.50	1.61	0.00	0.00	0.60	12.02	47
5.0-6.9	0.49	1.26	0.94	0.56	0.50	0.32	0.40	0.49	0.00	0.91	5.88	23
7.0>	0.82	0.75	0.45	0.00	0.00	0.00	0.67	0.00	0.00	1.51	4.19	17
TOTAL	3.58	4.99	4.32	2.56	1.11	2.07	2.81	0.70	0.20	3.02	25.36	
%	14	20	17	10	4	8	11	3	1	12		100

* Sample size 66 plots totalling 2.64 ha

Table A34. Waste volume of logs and slabs at high lead and grapple landings, winter logging, Vancouver Region TSAs and TFLs, 1981 logging, m³/ha*

Length (m)	Diameter inside bark (cm)										TOTAL	%
	15.0- 19.9	20.0- 24.9	25.0- 29.9	30.0- 34.9	35.0- 39.9	40.0- 44.9	45.0- 49.9	50.0- 54.9	55.0- 59.9	60.0+		
<1.0	0.00	0.02	0.00	0.21	0.14	0.26	0.00	0.00	0.00	0.00	0.63	1
1.0-2.9	2.40	2.24	1.81	1.62	1.20	2.16	0.77	0.47	0.57	3.47	16.71	16
3.0-4.9	5.53	6.90	6.45	7.21	2.40	1.85	0.77	0.00	0.00	3.47	34.59	34
5.0-6.9	0.94	3.37	1.94	2.70	0.72	1.85	1.16	1.41	0.00	13.02	27.10	27
7.0>	0.00	6.47	3.23	1.80	2.40	4.63	0.00	0.00	0.00	4.34	22.87	22
TOTAL	8.86	19.01	13.42	13.55	6.86	10.75	2.70	1.88	0.57	24.30	101.90	
%	9	19	13	13	7	11	3	2	1	24		100

* Sample size 17 plots totalling 0.92 ha